column **Marcel Levi**

A fundamental difference

NWO chair Marcel Levi helps clear up some of the misconceptions surrounding fundamental and applied science.

Delta ITP is celebrating its tenth anniversary and that's worthy of congratulations. I think you can say without a doubt that this Amsterdam-Leiden-Utrecht gravity consortium is an example of Dutch science at its best. And to think they focus on the incredibly complicated area of dark matter, the Big Bang, and quantum physics. You can hardly imagine science more fundamental.

There are many misunderstandings about fundamental science. One of them is the supposed contradiction to applied research. I think this picture isn't quite correct. Both fundamental and applied science aim to push the boundary between what we don't know and what we do know a little bit further each time. In applied science, this is usually because, for example, a direct societal issue needs to be solved. Fundamental science may lack these questions, but that doesn't mean that it will not eventually lead to solutions to major world problems. But it will probably happen many years later, with more uncertainty and no promises in advance. And with more surprises, because answers are also found to questions that had not yet been asked. Fundamental and applied science are part of the same continuum where knowledge ultimately leads to the solving of questions that make the world a better place, whether it's energy, climate, health or well-being.

You also often hear that there is less and less budget for fundamental science in the Netherlands. This is not really true either. Budgets for fundamental science have remained about the same in recent years. And, fortunately, there is even room for fundamental science in several new impetuses for science with an applied approach, such as the National Growth Fund (from the Ministry of Economic Affairs and Climate Policy and the Ministry of Finance – ed.). It is true, however, that budgets for fundamental science have not grown along with those for applied research. This has led to a lack of balance, and it is important to restore this with the new impetuses for science and knowledge over the next decade.

If you want to do something grand or compelling in the Netherlands these days, the word 'delta' is often attached to it, perhaps inspired by our magnificent Delta Works. For example, we now have a Delta Plan for Dementia, a Quantum Delta, a Delta Plan for Biodiversity, and a Medical Delta. What is 'delta' about Delta ITP? The website suggests a neat triangle connecting Amsterdam, Leiden, and Utrecht but that – for physicists – is a touch imprecise. A perfect triangle would be more likely to be between Diemen, Alphen aan den Rijn, and Maartensdijk. Also, Amsterdam, Leiden, and Utrecht lack an estuary that can lay claim to the description of a delta. But perhaps delta refers to the Greek letter often used to denote 'difference', and that applies here. Delta ITP is making a difference between what we didn't know before and what we know now, making the institute a fascinating and successful example of excellent fundamental science. ■

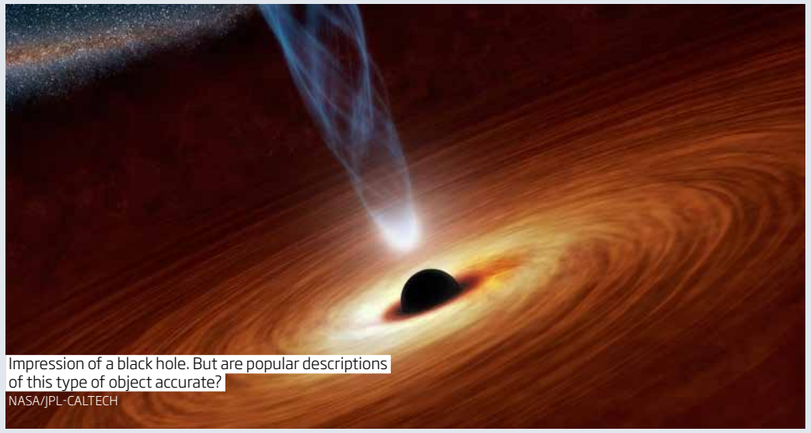
Fundamental and applied science are part of the same continuum

JEROEN OERLEMANS/NWO

Marcel Levi is an internist, professor of medicine, and president of the Dutch Research Council (NWO)

column **Marcel Vonk**

How details can disappear into a black hole



Impression of a black hole. But are popular descriptions of this type of object accurate?
NASA/JPL-CALTECH

What is a black hole? It's not the easiest question to ask a physicist. Fortunately, there are several standard answers available. 'A point in the universe where the escape velocity is greater than the speed of light', for example. Not the most exciting phrasing, but one that captures the point.

Although... The underlying idea behind the parallel between light speed and escape velocity is that nothing can go faster than light. So, absolutely nothing can escape a black hole. But does that follow from the above one-liner? Not really. If I were to build a tall tower on the black hole described and climb it, wouldn't I be able to escape from that point with less gravity? If I launch a rocket from my black hole – which then falls back in – would I be able to launch a new rocket from the highest point, and so on until something escapes?

All sorts of solutions seem possible, but you cannot escape a true black hole. To understand that properly, you need the general theory of relativity. Only when you realise that a black hole sucks in space faster than the speed of light and that this does not contradict Einstein's speed limit (which is, after all, about moving through space, not about space moving itself), do you realise that you will never escape, no matter how hard you swim against the tide of space.

Keep the lines from the scientist to the audience short

The above is an example of a problem that one frequently encounters as a scientist. It's not easy to explain your work to a wide audience without minor inaccuracies creeping in. In the case of black holes, the consequences of a shaky explanation may not be too bad, but if you're researching the spread of viruses or the economic impact of immigration, all kinds of things can go wrong if the public image doesn't correspond to your research findings.

Two things are important for honest communication of science. First, keep the communication lines from scientist to audience short. If a scientist tells his or her story to a communications person who writes a press release that is read by a journalist who writes a piece that is edited by an editor before it reaches the reader, there are four places in the telephone chain where information can be lost. So above all, let scientists who can tell a good story speak for themselves.

To those scientists, I would say: be honest. Tell your story, but also explain where you're using approximations. This is how we prevent the important details of science from disappearing into a black hole on their way to the public. ■

Marcel Vonk is a mathematical physicist at the University of Amsterdam, and, for Delta ITP, he is editor-in-chief of quantumuniverse.nl, a popular science site about physics. He also provides science popularisation for the Institute of Physics at the University of Amsterdam and has written several books on physics.